

"frames". Frames are further subdivided into "slots". The framing control function carries out the operation of generating and maintaining the time frame information by delineating each new frame by Start-Of-Frame (SOF) symbols. These SOF symbols are used by each of the slave devices on the network to ascertain the beginning of each frame from the incoming data stream.

[0023] In the preferred embodiment, the frame definition comprises a master slot, a command slot, and a plurality of data slots. The master slot is used for controlling the frame by delineating the SOF symbols. As described in further detail below, the master slot is also used for synchronizing the network. The command slot is used for sending, requesting and authorizing commands between the master device and the slave devices of the network. The master device uses the command slot for ascertaining which slave devices are online, offline, or engaged in data transfer. The master device further uses the command slot for authorizing data transmission requests from each of the slave devices. The slave devices use the command slot for requesting data transmission and indicating its startup (online) or shutdown (offline) state. The data slots are used for data transmission between the node devices of the network. Generally, each transmitting device of the network is assigned one or more corresponding data slots within the frame in which the device may transmit data directly to another slave device without the need for a "store and forward" scheme as is presently used in the prior art. Preferably, the master dynamically assigns one or more data slots to slave devices which are requesting to transmit data. Preferably, the data slots are structured and configured to have variable bit lengths having a granularity of one bit. The present invention provides that the master device need not maintain communication hardware to provide simultaneous open links between itself and all the slave devices.

[0024] Broadcast is supported with synchronization assured. This guarantees that media can be broadcast to many nodes at the same time. This method allows, for example, synchronized audio data to be sent to several speakers at the same time, and allows left and right data to be sent in the same frame.

[0025] Asynchronous communication is allowed in certain slots of the frame through the use of either master polling or CSMA-CD after invitation from the master.

[0026] The means for synchronizing the network is preferably provided by a clock master function in the master device and a clock recovery function in the slave devices. Each node device in the network system maintains a clock running at a multiple of the bit rate of transmission. The clock master function in the master device maintains a "master clock" for the network. At least once per frame, the clock master function issues a "master sync code" that is typically a unique bit pattern which identifies the sender as the clock master. The clock recovery function in the slave devices on the network carries out the operation of recovering clock information from the incoming data stream and synchronizing the slave device to the master device using one or more correlators which identifies the master sync code and a phase or delayed locked loop mechanism. In operation, the clock master issues a "master sync code" once per frame in the "master slot". A slave device trying to synchronize with the master clock will scan the incoming

data stream for a master sync code using one or more correlators. As each master sync code is received, the phase or delayed locked loop mechanism is used to adjust the phase of the slave clock to that of the incoming data stream. By providing a common network clock on the master device, with slave devices synchronizing their local clocks to that of the master clock, support for synchronous and isochronous communication in addition to asynchronous communication is provided. Time reference between all device nodes is highly accurate eliminating most latency and timing difficulties in isochronous communication links.

[0027] As noted above, each transceiver carries out the operation of transmitting and receiving data. In wireless transmission, data is transmitted via electromagnetic waves, which are propagated through free space. In the preferred embodiment, the invention provides data transmission via baseband wireless technology. This method uses short Radio Frequency (RF) pulses to spread the power across a large frequency band and as a consequence reduces the spectral power density and the interference with any device that uses conventional narrowband communication. This method of transmitting short pulses is also referred to as Ultra Wide Band technology. This present implementation provides baseband wireless transmission without any carrier. Use of baseband wireless greatly reduces multipath fading and provides a cheaper, easier to integrate solution by eliminating a sinewave carrier. According to the invention, there is no carrier to add, no carrier to remove, and signal processing may be done in baseband frequencies.

[0028] Additionally, using short pulses provides another advantage over Continuous Wave (CW) technology in that multipath fading can be avoided or significantly reduced.

[0029] The present invention further provides a modulator or other means for modulating data as is known in the art, a demodulator or other means for demodulating data as is known in the art, and a gain controller or other means for controlling the gain of each of the transceivers. In the preferred embodiment, the means for modulating data comprises a modulator which converts the TDMA frames into streams of baseband pulses. The means for demodulating data comprises a demodulator which converts incoming baseband pulses into TDMA frames.

[0030] In a first embodiment, the invention provides pulse modulation and demodulation with on/off keying. The transmitting device modulates a "1" into a pulse. A "0" is indicated as the absence or lack of a pulse. The receiver locks on to the transmitted signal to determine where to sample in the incoming pulse streams. If a pulse appears where the signal is sampled, a "1" is detected. If no pulse appears, a "0" is detected.

[0031] In another exemplary embodiment, the invention provides pulse modulation and demodulation using a pulse amplitude modulation scheme. Here, the transmitting device modulates a digital symbol as a pulse amplitude. For example, a three bit symbol can be represented with eight levels of pulse amplitude. The receiver locks on to the transmitted signal to determine where to sample the incoming pulse stream. The level of the pulse stream is sampled, and the pulse amplitude is converted to a digital symbol.

[0032] The gain controlling means carries out the operation of adjusting the output gain of the transmitter and adjusting the input gain of the receiver.